



The results of tectonic keratoplasty

Tectonic keratoplasty

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Abstract

Aim: In this study, we aimed to evaluate the results of tectonic penetrating keratoplasty (PK) in the treatment of the non-traumatic corneal perforations. **Material and Method:** Thirty-five eyes of 35 patients who underwent tectonic PK between January 2000 and January 2017 were included in this study retrospectively. The cases were evaluated in terms of age, sex, etiology, follow-up period, anatomical stability, graft clarity, best corrected visual acuity and complications. **Results:** Twenty-one of the 35 patients were male. The mean age was 49.4. The mean follow-up period after keratoplasty was 43.2 ± 8.4 months. Predisposing factors leading to perforation were microbial keratitis in 17 eyes (48.5%), corneal melting associated with ocular surface disease in 13 eyes (37.1%) and perforated descemetocoele in 5 eyes (14.4%). Anatomical stability was achieved in 94% of the eyes. The graft clarity rate was 62% at the end of the follow-up period. Approximately half of the cases obtained a final visual acuity of 0.2 and better postoperatively. The most common complication was glaucoma. **Discussion:** Emergency PK is required to maintain anatomical integrity in corneal perforations. Success rate is evaluated with anatomical integrity; graft clarity and visual acuity are not satisfactory. However, prognosis can be improved by the control of the underlying pathology, inflammation and intraocular pressure.

Keywords

Corneal Ulcer; Corneal Perforation; Penetrating Keratoplasty; Tectonic Keratoplasty

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Introduction

Corneal perforations are considered as ophthalmic emergencies that require immediate treatment. Many primary diseases can cause corneal perforation [1]. Non-traumatic corneal perforations can be classified as infectious factors (bacterial, viral, and fungal keratitis) and non-infectious factors (ocular surface disease and autoimmune causes) [2].

The management of non-traumatic corneal perforations is challenging, and the treatment should be focused on preserving ocular integrity with the aim of protecting the visual function. In the treatment of these perforations, non-surgical methods such as bandage, soft contact lenses, tissue adhesives, and surgical methods such as multilayered amnion membrane transplantation, conjunctival flap, and tectonic penetrating keratoplasty are used [3]. Treatment depends on the size and location of the perforation as well as the underlying disease.

The purpose of this study is to evaluate the results of tectonic penetrating keratoplasty in non-traumatic corneal perforations in our clinic.

Material and Method

Between January 2000 and January 2017, 35 eyes of 35 patients who underwent tectonic PK at Haydarpasa Numune Training and Research Hospital Eye Clinic, Istanbul, Turkey were retrospectively investigated. The cases were evaluated regarding age, gender, etiology, follow-up duration, anatomical integrity, graft clarity, visual acuity, and complications. After the institutions' ethical committee approval was obtained, the study was conducted in accordance with the ethical standards of the Helsinki Declaration. Informed consents were taken from all the case subjects before the surgical procedure.

In all cases, donor cornea had been removed within the following six hours of death, and stored in the storage medium (Optisol; Chiron Vision, Claremont, CA, USA). Donor buttons has been punched from the endothelial side, 0.25-0.50 mm larger than the trephine size. Graft measurements were based on the size of the original corneal pathology. The graft was sutured to the recipient tissue with 10.0 nylon interrupted sutures.

In the postoperative period, topical 1% prednisolone acetate and 0.5% moxifloxacin ophthalmic solution were applied hourly. The treatment lasted for 6-12 months with tapered dose. In all cases, 1 mg/kg of systemic steroid was added to the treatment for 4-6 weeks. In the cases of infectious keratitis the antimicrobial therapy which was initiated before PK was continued after surgery according to the clinic of the patient. In the cases of herpetic keratitis, oral acyclovir 800 mg/day was given for one year. Antiglaucomatous agents and ocular lubricants were added to treatment in the required cases.

Results

Twenty-one of our cases were male, and 14 were female. The average age of the patients was 49.4 years. The mean follow-up period was 43.2 ± 8.4 months. In 17 cases the cause of the perforation in 17 eyes was infectious keratitis. Eleven of these eyes had necrotizing herpetic stromal keratitis, 4 had bacterial keratitis, and 2 had fungal keratitis. The etiology for corneal perforation was corneal melting associated with ocular surface disease (persistent epithelial defect, alkali burn, neurotrophic

ulcer, rheumatoid arthritis) in 13 eyes and perforated desmatocele in 5 eyes (Table 1).

Table 1. Factors causing the perforation

Factors Causing the Perforation	Eye	%
Ocular Surface Disease	13	37.1
Herpetic Necrotizing Stromal Keratitis	11	31.4
Bacterial Keratitis	4	11.4
Perforated Descemetocoele	5	14.2
Fungal Keratitis	2	5.9
Total	35	100

After PK, anatomical stability was obtained in all eyes, but in the final visit, phthisis bulbi has developed in two eyes. In our study, anatomical stability was obtained in 94% of the cases.

Recurrence was seen in 3 out of the 11 HSC patients. In three cases, the graft lost clarity. In four eyes with bacterial keratitis, anatomic stability was achieved after PK, and the infection did not repeat.

Glaucoma was seen in eight eyes postoperatively. In three eyes the intraocular pressure (IOP) could not be controlled by medical treatment, and trabeculectomy was performed. Other surgical interventions that were applied after PK were as follows; cataract extraction in 3 eyes, re-keratoplasty due to the graft necrosis in 2 eyes and AMT in one eye.

During the follow-up period, graft clarity was maintained in 22 eyes (62%). The reasons for the reduction of graft clarity in the other thirteen eyes were as follows: phthisis bulbi in 2 eyes, HSK recurrence in 3 eyes, glaucoma decompensation in 1 eye, an irreversible immune reaction in 2 eyes and ocular surface disease in 5 eyes.

The best corrected visual acuity was 0.2 and over in 17 eyes (49%). The causes of decreased visual acuity despite graft clarity were: irregular astigmatism in two eyes, retinal detachment in one eye, and cystoid macular edema in one eye.

Discussion

Infectious and autoimmune corneal diseases may cause severe ocular inflammation and corneal melting, which may result in corneal perforations that have effect on visual acuity and in the most cases threaten the ocular integrity [4]. In order to avoid the occurrence of the complications such as endophthalmitis and secondary glaucoma in the perforated eyes, an immediate treatment is needed to preserve the ocular anatomical integrity [5]. However, the damaged recipient tissue increases postoperative inflammation and causes severe complications ranging from the graft rejection to necrosis. Two of our cases underwent keratoplasty due to the graft necrosis.

Infectious keratitis could lead to corneal perforation through changes in corneal epithelial integrity, reaching the corneal tissue, and to the release of proinflammatory cytokines from the corneal epithelium and stroma. The prognosis and success rate of the infectious keratitis varies according to the several factors including virulence of the microbial organism, keratitis diffusiveness and associated ocular inflammation [2]. Xie et al. [1] reported that the infectious keratitis is the most common cause for the non-traumatic corneal perforations. Thus, in our study,

half of the cases consisted of the infectious keratitis.

In bacterial keratitis, surgery is more difficult due to the necrosis of the recipient tissue but the postoperative recurrence is usually not observed. In our 4 cases of bacterial keratitis, eradication of the disease and the anatomical success were achieved after the tectonic PK.

Herpes simplex keratitis is the most common cause of viral keratitis which leads to the corneal perforation [5]. There is a frequent recurrence in the PKs performed in the active phase of the herpetic keratitis. The success of the keratoplasty is higher in the stable period when the inflammation is under control. However, in the study of HEDS group, it was also reported that oral acyclovir improves success and prevents recurrence [6]. Early surgery was performed due to the necrotizing stromal keratitis in 2 of our patients and non-inflammatory neurotrophic keratitis in other 8. In our study, recurrence developed in 3 of the 11 eyes with HSK after PK. We concluded that the low recurrence rate was related to the oral antiviral prophylaxis with the use of the oral and/or topical steroid.

In our study, high success rates were obtained similarly to the other studies with the preservation of ocular integrity in 94% of the cases [7-9]. Graft clarity was also achieved in 62% of the cases. The most common cause of graft failure was the underlying ocular surface disease in our cases. Nobe et al.[10] reported that PKs performed on corneal perforations occurred due to the ocular surface diseases were unsuccessful. In our study, graft failure developed in 5 of the 13 eyes which underwent tectonic PK due to the ocular surface disease in our study. Intraocular pressure elevation after the penetrating keratoplasty is a common complication and is an important cause of early graft failure. Inflammation, pupillary block, angle compression, steroid use, and previous glaucoma presence were held responsible for the increased IOP in this period. In the late period, chronic angle closure is caused by the peripheral anterior synechia [11]. The most common complication observed in our study was glaucoma. Glaucoma could not be managed by the medical treatment in 3 of the eight eyes, and surgical treatment was applied.

Visual rehabilitation is the primary objective in the optical penetrating keratoplasties while it is secondary in tectonic keratoplasties. Visual acuity of 0.2 and above was determined in approximately half of our cases.

Tectonic keratoplasty is an emergency and high-risk surgical procedure. For this reason, the aim in the treatment of ulcerations and melting in the cornea is primarily to prevent the development of perforation. However, when the perforation develops despite all the efforts, tectonic keratoplasty must be done immediately to provide the anatomical integrity of the globe, especially in large perforations where tissue adhesives, therapeutic contact lenses and patch grafts are insufficient. The postoperative treatment of the systemic and local etiology causing the ocular surface disease would increase the surgical success.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of

the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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